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Governance, Corruption, and Trade in the Asia Pacific Region

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Abstract

This paper examines the impact of reducing corruption and improving transparency to lower trade costs in the Asia Pacific Economic Cooperation region. The authors find, based on a computable general equilibrium model, significant potential trade and welfare gains for Asia Pacific Economic Cooperation members, with increased transparency and lower levels of corruption. Results suggest that trade in the region would increase by 11 percent and global welfare would expand by $406 billion by raising transparency to the average in the region. Most of the increase in welfare would take place in member economies undertaking reform. Among the reformers, the gross domestic product of Vietnam, Thailand, Russia, and the Philippines would increase approximately 20 percent. The benefits to Malaysia and China would also be substantial with increased transparency and lower levels of corruption.

This paper—a product of the Trade Team, Development Research Group—is part of a larger effort in the department to explore the link between transparency, competitiveness, and trade costs. This work is aligned with the "Transparency and Competitiveness" project supported through a Trust Fund established by the Australian Department for Foreign Affairs and Trade and the Australian Agency for International Development (AUSAID). It is alingned with work in the Multi-Donor Trust Fund for Trade and Development project on "Trade Costs and Facilitation" of the World Bank. Additional information is available at: http://econ.worldbank.org/projects/trade_costs/. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at jswilson@worldbank.org or kabe@mail.dendai.ac.jp.

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1. Introduction

This study examines the economic impact and welfare gains associated with policy reform to improve transparency in the Asia Pacific Economic Cooperation (APEC) region. We estimate these gains with a computable general equilibrium (CGE) model. The effects of improved transparency on trade and welfare through trade policy reform are largely unexplored. Most recently, Helble, Shepherd and Wilson (2007) estimated the impact of the improvement of transparency in APEC on bilateral trade in a gravity model approach. The study found a significant potential for trade expansion with improvement in the transparency of trade policy measures in APEC with estimated an increase in the intra-regional trade among APEC members of 7.5 %.

Our study builds on the analysis and approach by Helble, Shepherd and Wilson (2007) in several new ways. First, we estimate the effects of transparency improvements in APEC on various important economic variables, such as welfare and production in both macroeconomic and sector terms, in addition to trade. The gravity model, while on a solid econometric and theoretic foundation, is only capable of providing estimates of the impact of reform on nominal bilateral trade flows. In particular, we are interested here in assessing the economic benefits associated with welfare in the APEC region to inform priority setting in APEC related to the goal of open trade in the region by 2010 for developed member economies and 2020 for developing members.

Second, our analysis provides a valuable way to revisit results on potential gains found with the gravity model estimates in earlier work. The general equilibrium framework, using the GTAP mode, in our study will explicitly demonstrate the transmission mechanism of policy reform steps -- in our case transparency improvement in the trade policy -- throughout the APEC member economies at the sector level.

Third, we estimate the impact of transparency improvements on trade costs and welfare by distinguishing between the benefits of reducing waste and inefficiencies in trade procedures and policies from benefits of reform related to lessening the burden of corruption and other nontransparent payments -- such as bribes and irregular payments demanded of traders at the border. We find that there are different impacts on welfare

associated with these two types of reforms, although their impacts on trade costs themselves are largely the same.

Fourth, the GTAP model deployed in this analysis covers the entire world and is not limited to the APEC economies. The model we use allows for observation of the impacts of bilateral trade flows between APEC member and non-member economies, placing a focus on the issue of trade diversion or creation under differing scenarios.

The paper proceeds as follows: in Section 2 we survey the empirical literature on relationships between transparency and trade costs. Section 3 discusses our methodological approach and model, and Section 4 provides results and implications from the analysis.

2. Trade Facilitation, Transparency and Trade Costs

Trade facilitation reform to lower transactions costs is one of the major policy goals in the Asia Pacific region and among APEC member economies. Traditionally in APEC, trade liberalization involves the reduction of traditional trade barriers, such as tariffs and import quotas. Trade facilitation generally covers measures to reduce trade costs both at the border and internal to member economies. The Bogor Declaration of APEC leaders in 1994 include this dichotomy. With the reduction in traditional trade barriers over the past decade, however, attention has shifted to trade facilitation measures as a major step toward lower trade costs and more open trade in the region.

Trade facilitation measures most often refer to administrative or procedural steps in the trading environment that affect costs. This includes streamlining customs clearance procedures, harmonizing product standards and conformance certifications, or deregulating licensing requirements in the transport sector, for example. The improvement of transparency in trade policies, however, is also a factor to consider when addressing reform steps toward lowering trade transactions costs.

Among previous estimates of the potential gains to reform in trade facilitation, a research report by APEC Economic Committee (APEC (1997)), drawing on the survey

results by the Cecchini Report (1988), assumed that the overall trade facilitation measures committed in Individual Action Plans in 1996 of the APEC members would reduce the trade costs by 1 - 2 percent. The leaders of APEC in 2001 committed to implementing the APEC Trade Facilitation Principles (Shanghai Accord) with a view to reducing trade transaction cost by 5 percent of transaction costs by 2006.

More recently, Francois et. al. (2003) used a policy scenario of reduction in trading costs related to trade facilitation measures expected with success in the Doha round of trade talks at the World Trade Organization. The cost reduction effect of trade facilitation, based on the range of available estimates, was assumed to range between 1.5 percent (partial liberalization) and 3 percent (full liberalization) of the value of world trade. Most other studies completed to date use the estimated cuts in trade costs by trade facilitation as the initial shock to general equilibrium models. These studies share a common conclusion that trade facilitation measures would bring about significant improvement in global welfare.

Compared to empirically estimated trade costs, the assumed magnitude of trade cost reduction from the trade facilitation reform of about 3 to 5 percent of import prices appears modest and feasible. For example, Anderson and van Wincoop (2004) suggest that trade costs add up to 74 percent in terms of an ad valorem tax equivalents, including all transport and border-related costs from foreign producers to the border of the importing country[3]. This also implies that there exists further potential to reduce global trade costs. Improved transparency is likely one of the more important of such policies with the potential to lower trade costs, especially in the Asia Pacific region.

Trade Facilitation and Transparency Improvements in Trade Policy

Our interest here rests with the identification and quantification of the initial shocks from improvement in the transparency of trade policies on import prices or other changes in exogenous variables, if any. Helble, Shepherd and Wilson (2007, HSW, hereafter) undertook the first evaluation of the effects of improving the transparency of

[3] According to Anderson and van Wincoop (2004), the additional local distribution costs to the final consumer of the importing country is 55 %. As such, the total trade costs reach 170 %.

trade policy on trade in APEC. The authors constructed indices of transparency including an exporter transparency index (ETI) and importer transparency index (ITI) through principal factor analysis.

Factor analysis is a statistical technique to produce an index summarizing performance across a number of correlated indicators. HSW derived an index by assuming that an unobserved factor ('transparency') is responsible for the common variation in the original set of indicators. Statistical techniques can be used to identify that unobserved factor in terms of a weighted average of the original indicators.

This methodology reflects the approach taken by Anderson and Marcouiller (2002) in producing a composite security index, and is close to the principal components methodology used by Francois and Manchin (2007) to produce summary indices of country performance in the areas of infrastructure and institutions. We prefer the first principal factor to the first principal component because the former allows for variation within the indicator set to be due to both common and individual causes, while the latter assumes that all variation is common

Specifically, the ITI index in HSW is the first principal factor, combining 11 variables linearly; i.e. 3 variables on predictability of customs administration (time spread for import, standard deviation of irregular payments, and favoritism), 4 variables of predictability and the simplification of trade policy (percentages of bound tariff lines, tariff dispersion, hidden barriers, and E-readiness), and 4 variables on simplification of customs administration (clearance time of imports, numbers of agencies involved in import, numbers of documents required for import, and irregular payments)[4]. Then the transparency indices enter as regressors in a gravity model to explain changes in bilateral trade in the Asia Pacific. Appendix A introduces the estimate of ITI in HSW, and revisits the implication of the index on trade cost. As indicated in the next subsection, the exporter transparency index is found insignificant in the gravity regression, and therefore, the Appendix omits the explanation on it.

[4] The calculated indexes are normalized across the economies in APEC region to be between zero to one.

The specification of the gravity model aligns with a microeconomic general equilibrium foundation postulated by Anderson and van Wincoop (2003), which derived a gravity-like model of exports from economy *i* to economy *j* in sector *k* (X_{ij}^k), as follows:

$$\log\left(X_{ij}^k\right)=\log\left(E_j^k\right)+\log\left(Y_i^k\right)-\log\left(Y_w^k\right)+\left(1-\sigma_k\right)\log\left(t_{ij}^k\right)-\left(1-\sigma_k\right)\log\left(P_j^k\right)-\left(1-\sigma_k\right)\log\left(\Pi_i^k\right)+\varepsilon_{ij}^k \qquad (1)$$

where: Y_i^k : output of *i*

E_j^k : expenditure of *j* ;

Y_w^k : aggregate (world) output in commodity *k*;

σ_k : elasticity of substitution in commodity *k*;

t_{ij}^k : bilateral trade barrier from *i* to *j* , $p_{ij} = t_{ij}\, p_i$

$\left(P_j^k\right)^{1-\sigma_k} = \sum_{i=1}^{N} \Pi_i^{\sigma_k-1} \omega_i^k \left(t_{ij}^k\right)^{1-\sigma_k}$: inward trade resistance

$\left(\Pi_i^k\right)^{1-\sigma_k} = \sum_{j=1}^{N} P_j^{\sigma_k-1} \omega_j^k \left(t_{ij}^k\right)^{1-\sigma_k}$: outward trade resistance

ω_i^k : *i*'s output share in sector *k*;

ω_j^k : *j*'s expenditure share in sector *k*;

ε_{ij}^k = Random error term

The subscripts and superscript *i*, *j*, *k* indicate exporter economy, importer economy, and the group of traded commodities, respectively.

In the equation, bilateral trade reflects the magnitudes of the economies of exporter, importer and the world, and bilateral trade barrier, as well as multilateral trade resistance. The equation contains unobservable explanatory variables, namely, bilateral-specific trade barriers, t_{ij}, and inward and outward trade resistance, *P* and Π. To make the regression operational, Anderson and van Wincoop (2003) specified the trade cost function as $t_{ij} = b_{ij} d_{ij}^{\rho}$, where b_{ij} is the coefficient to be estimated and d_{ij} is the bilateral distance. To manage the multilateral resistance terms, the authors derived the reduced and implicit form of the equation with all the exogenous variables (distance, intra-trade dummy and the production share of the economy in the world) in the right-hand side, and use a non-linear least square method. They indicated an alternative approach to assume a fixed-effect structure for the country-specific multilateral

resistance terms, and estimate the linear equation with replacing the multilateral resistance terms with country-specific dummy variables.

Helble, Shepherd and Wilson (2007) adopt a fixed effects approach, and specified bilateral trade t_{ij}^k not with the distance but with other observable variables related to trade barriers, including the transparency indexes. With some modification[5], the specification of the trade cost function appears as follows:

$$\log\left(t_{ij}^k\right) = \alpha_{ij} + \beta_1 \log\left(1 + \tau_j^k\right) + \beta_2 \log(ntb_j^k) + \beta_3 \log(ITI_j) + \beta_4 \log(ETI_i) \qquad (2)$$

The first term of the right hand side is a trading-pair dummy variable, representing the trading-pair-specific fixed effect other than explained by other variables, likely covering such as transport costs, historical factors, and geographical particularities between the trade pair. The importer's applied tariff is denoted τ_{ij}^k. The term ntb_j^k gauges the presence of non-tariff barriers in the importing economy. More importantly, the two transparency indexes entered here in the right-right hand side to explain the trading costs.

Replacing (2) into (1), and adding γ_k, as representing commodity-specific fixed-effect, and omitting the multilateral resistance terms[6], we obtain the specification of the gravity model (3):

$$\begin{aligned}\log\left(X_{ij}^k\right) &= \alpha_{ij}(1-\sigma_k) + \beta_5 \log\left(Y_i\right) + \beta_6 \log(Y_j) + \beta_1(1-\sigma_k)\log\left(1+\tau_j^k\right) + ... \\ ... &+ \beta_2(1-\sigma_k)\log(ntb_j^k) + \beta_3(1-\sigma_k)\log(ITI_i) + \beta_4(1-\sigma_k)\log(ETI_i) + \gamma_k + \varepsilon_{ij}^k\end{aligned} \qquad (3)$$

where *X*: the amount of export from i to j

Y: Gross Domestic Product in i or j

1 + τ: the power to import price because of import tariff

(τ is ad valorem import tariff rate in j)

ntb: the index of non-tariff barrier in j

[5] The original specification of HSW includes the trading-pair-specific fixed effect term in the trade regression, not in the trade cost function here, but the inclusion of the term may better explain the structure of trade cost.

[6] This omission reflected the purpose and priority of the study to investigate the bilateral effects.

ITI: importers transparency index in j

ETI: exporters transparency index in i

ε : random error terms

The coefficients β_5 and β_6 should be imposed unity in the theory, but a number of existing references release the imposition finding little effect from this. The equation (3) assumes that any measures to change the trade cost factor t_{ij} would bring about the change in the bilateral trade between *i* and *j*, only through the change of trade costs. In sum, all the trade facilitation measures including the reduction of non-tariff barriers and improvement in the transparency of trade policy, would once bring about decline in the trade cost factor, and then cause the positive impacts to bilateral trade. One should note that the model formally treats the improvement of transparency in trade policy as one of the trade facilitation measures to reduce trading costs.

Tariff-equivalent Estimates of Improving the Transparency of Trade Policy

Helble, Sheperd, and Wilson (2007) regressed the equation (3) with an econometric technique. The estimated coefficients of effective tariff and import transparency index (ITI) are 1.421 and -1.864, respectively in the baseline case. The exporter transparency index (ETI) is found insignificant in the regression in HSW, therefore, we do not use the index to estimate welfare effects in this paper. The interpretation of HSW is that in import markets, rather than export markets, transparency matters a great deal to bilateral trade. (Using the estimates of HSW, one may obtain the tariff-equivalent measure of the importers transparency improvement.)

We may recall the equation $p_{ij} = t_{ij} p_i$ where p_{ij} is the price of imports from i for the consumer in j, and p_i is exporter's supply price, net of trade costs. This leads to $d\log(p_{ij}) = d\log(t_{ij})$ if p_i is fixed, where $d\log(.)$ denote percentage change. In equation (3), both nominal tariff reduction and improvement of importers' transparency contribute to the reduction of the trade cost factor t_{ij} and decline in p_{ij}. In turn, from (1), the decrease in the bilateral trade cost factor t_{ij} will increase the bilateral trade, unless the multilateral trade resistance significantly offset the impacts. If the transparency

index changes by 1 percent, then the trade cost factor changes by β_3 percent and change trade by $\beta_3(1-\sigma_k)$ from equation (3)[7]. The same percentage change in the trade cost factor is brought about by β_3 / β_1 percent change in the tariff factor $(1+\tau_{ij})$. From the estimate by Helbel, Shepherd and Wilson (2007), the ratio is about - 1.312 (= -1.864 /1.421)[8]. This gives us the tariff-equivalent (more accurately, tariff-power-equivalent) measures for the transparency index changes. One may consider this ratio to convert from the percentage change in ITI to that in tariff power to bring about the same amount of changes in trading costs.

The rather large value of the estimated coefficient of the ITI should reflect the characteristics of this index as a proxy of institutional capacity and efficiency in trade policy. The ITI is essentially a principal factor, which is mechanically calculated from the eleven variables (see Appendix A). While these variables should commonly indicate the degree of transparency in trade policy, the variables may contain wider information, not limited to transparency. The ITI may reflect not only transparency in a narrow sense, but also institutional efficiency, or even modernization of trade procedures in an economy. An economy with a higher ITI score is likely to have better governance and institutions in trade. In this sense, the index in the gravity regression should be regarded as proxy variable, representing institutional efficiency, openness and fairness in trade – i.e. transparency.

The comparison among the results from the various sector base regressions confirms the plausibility of the magnitude of the conversion factor. HSW undertake the same regression on the sector/commodity breakdowns. The estimated conversion factors and the cases are: -2.61 for all the commodities, -1.22 for only the non-basic manufacture (HS > 83), -2.27 for homogeneous goods (goods traded on an organized exchange, or reference priced goods). As a result, our reference conversion factor, -1.312, locates

[7] This applies only when the change in the bilateral trade cost factor does not significantly change the multilateral trade resistance terms.

[8] These figures are the baseline estimate, covering all the commodities except for raw materials (HS 1-27). The coefficient of the tariff variable is significant only at a 15% level in the specific regression. However, the estimated value is around the mid-point among the various specifications.

rather modest side. Moreover, the empirical findings of Wilson, Mann and Otsuki (2005), which is the pioneering, article to assess the trade facilitation policies, are comparable. Their reference regression of bilateral trade has, as regressors, bilateral tariff rates, distances, mass variables (such as GDPs), together with various trade facilitation indicators.

The trade facilitation indicators include (1) port efficiency of exporters and importers, (2) custom environment of importers, (3) regulatory environment of exporters and importers, and (4) service sector infrastructure of exporters and importers. Among these, the indicators closely related to importers transparency (and their estimated elasticity) are customs environment of importers (0.47), regulatory environment of importer (0.28), and service sector infrastructure (0.73). Because these variables are normalized between one and zero, we add them up to obtain the elasticity of simultaneous progress of the transparency related trade facilitation, estimated to be about 1.48. The estimated coefficient of bilateral tariff rates is -1.16. The tariff-factor-equivalent conversion factor is about 1.3. This reinforces the plausibility of our conversion factor[9].

[9] Again, it should be reminded that ITI is a proxy of institutional capacity and efficiency.

3. A Framework and Methodology for the Model Estimates

Based on the econometric estimates in the former section, our study adopts a computable general equilibrium model and database from GTAP (Global Trade Analysis Project)[10] to estimate the effects on welfare and other variables, under the baseline scenario, namely to improve ITI in the APEC region such that no economy is below the current regional average. The model simulation provides a rough idea of the magnitude of welfare gains and other effects, together with the theoretical mechanism of the creation of such effects. The aggregation of the region and industrial sectors (commodity) is 21 regions of the world times 4 sectors (see Appendix B for the list of aggregation). All the member economies in APEC except for Papua New Guinea and Brunei have their own entry in the aggregation. The four sectors in the industrial aggregation correspond to the classification used in the empirical analysis by Helble, Shepherd and Wilson (2007). The database with its base year at 2004 is updated to reflect the changes in the relative scale of the economies to the year 2006, by extrapolating the growth of labor force, capital stock and technical progress. In addition, the abolishment of the multi-fiber agreement is applied to the database, as a major revision. Our simulation adopts the basic model option that assumes constant returns to scale with perfect competition. The simulation with the basic option identifies only the long-run economic effects through efficiency improvement, providing results that are easier to trace. The section below outlines the methodological issues regarding the selection of the shock variables, and quantification of such policy shocks.

Model Specification for Reducing Trade Costs: The Iceberg Approach

The model simulation chosen requires identifying and quantifying the initial shocks in our exogenous variables. In the case of trade facilitation as an initial shock to a CGE model, modelers have used a so-called iceberg specification[11] as a standard approach. The latest GTAP model, version 6.2, provides a ready-made variable (*ams)* to enable

[10] The GTAP released the latest version (version 7, pre-release 6) of the database in 2008. The base year of the database is the year 2004.

[11] This illustrates the situation that a fraction of goods shipped is lost (melt) in transport, which is a pure loss in the process of trade.

specific simulation for the policies to progress the technology of trade, and reduce the trade costs under the assumption of horizontal long-run supply curve. . The related equations for bilateral trade of specific goods in the GTAP model follow below, with lower case variables denoting percentage change. The arguments in the parentheses represent as follows: *i*; commodity, *r*: exporting region, and *s*: importing region.

$$pfob(i,r,s) = pm(i,r,s) - txs(i,r,s) \quad \text{(a)}$$

Export Taxation: This describes that the percentage change in export price in the world (FOB price, *pfob*) from region *r* to region *s* fully reflects the percentage change in domestic market price in exporting region *r* (*pm*), net of negative export tax, (*txs*).

$$pcif(i,r,s) = FOBSHR(i,r,s) * pfob(i,r,s) + TRNSHR(i,r,s) * ptrans(i,r,s) \quad \text{(b)}$$

International Transportation: Reflecting the international transportation costs, this describes that the percentage change in CIF price (*pcif*) fully reflects the weighted average of the percentage change in FOB price (*pfob*) and the percentage change in international transportation price (*ptrans*).

$$pms(i,r,s) = tms(i,r,s) + pcif(i,r,s) \quad \text{(c)}$$

Import Taxation: This describes that the percentage change in domestic price of imported goods *i* (*pms*) fully reflects the percentage change in CIF price (*pcif*) plus that in bilateral import tariff factor (*tms*).

$$pim(i,s) = \sum_k \left[MSHRS(i,k,s) * \{ pms(i,k,s) - ams(i,k,s) \} \right] \quad \text{(d)}$$

Composite Import Price of Specific Goods in Importer: This describes that the percentage change in composite price of imported goods *i* (*pim*) fully reflects the weighted average of the percentage changes in import prices from each exporting region (*pms*) minus the cost-reducing technical progress (*ams*). The weights (*MSHRS*) are the shares of the exporting countries in the imports. The change in the composite price of imports brings about the substitution process between imported and domestic goods for the domestic users. In the GTAP model, the variable *ams*, import-augmenting technical change, is normally used as the exogenous shock variable for the simulation of the importing cost reduction, particularly that from trade facilitation measures. If one percent increase in *ams* takes place for all exporters, the price of the imported goods

in the region in *s* declines by one percent. In the case that only the price of a specific imported goods from region s decline, the relative price of the import price of the goods from that specific region declines more, compared to the composite (weighted averaged) price of that imported goods from all over the world.

$$qxs(i,r,s) + ams(i,r,s) = qim(i,s) - ESUBM(i) * [\, pms(i,r,s) - ams(i,r,s) - pim(i,s)]$$

……. (e)

Substitution Effects– Armington Structure: The demand side will react by substituting toward cheaper imports. The rate of change in the quantity of the bilateral export from *r* to *s* (qxs) and the amount of reduced waste (ams) in the trading process will be equal to the rate of change in total import of the goods in the region plus the substitution effect. Based on Armington (1969), the rate of change in the share of imports from a region is proportional to that in relative import prices with the elasticity, *ESUBM*. The same structure applies to the substitution between imports and domestically produced goods.

An issue to consider is that the variable *ams* locates at the last stage of the price pass-through process. Empirical findings suggest that exporters, not importers, bear much of the costs of trade. In contrast, the shock to *ams* causes the change in the prices of imported goods and not those of exported goods. In fact, this issue does not preclude the use of *ams* as an initial shock. The GTAP model assumes in principle a long-run price adjustment mechanism whereby producers can fully pass on the costs to final consumers[12]. The exogenous variable *ams* represents technical progress, which leads to the reduction of supply prices. With the export price fixed, this translates into a reduction in trade costs. In this model structure, one may implement a shock of cost-reducing technical progress on any variable at any stage in the price pass-through process[13]. Many of the trade facilitation reform measures considered here simply

[12] The models with long-run nature normally assume the horizontal long-run supply curve, where any change in supply costs is passed on to the consumers. The theoretical model in Anderson and van Wincoop (2003) also assume the full pass-through process of the prices. Also in reality, while observed FOB prices do not include transportation costs, they tend to include other costs that are borne by the exporters.

[13] However, tax variables, such as import and export tariffs (tms and txs) should not be used as shock variables for most of the trade facilitation, because the model will react to the change of

eliminate the pure waste (dead-weight loss) which occurs in the importing process. In essence, therefore, the cost recovery from such facilitation measures represents a form of technological progress, represented by *ams*.

Reducing Trade Costs by Reducing the Scope for Corruption and Other Nontransparent Payments

The standard treatment introduced above applies to most of the trade facilitation measures we are interested in here. Some components of the transparency improvement require, however, further elaboration. In particular, as evidenced by the fact that the transparency indexes include the degree of irregular payments – as a proxy for corruption and other nontransparent payments – in each member economy, some form of tax-like transfer payments or bribes are sometimes demanded of exporters and importers. Reducing payments under such rent-seeking activities in the importing countries will serve to lower trade costs in the same way as other trade facilitation improvements. However, it cannot be simply treated as technical progress in measuring welfare impacts because this brings about a transfer of income to someone in the importing countries. The removal of the transfer will cause the reduction of transfer income, as well as trade costs. Accordingly, the welfare impact from the reduction of such transfers is expected to be smaller than that from technical progress, if the rates of the reduction in trade cost are the same.

Such components of transparency improvement mean the reduction of transfer or virtual taxes levied on imports. The proper methodology here is to treat such payments as an import tax, and apply shocks to the rates of import tariff. Because government consumption does not depend on the level of tax collections in the GTAP model, this treatment does not bias expenditure. This has the merit of keeping the general model structure intact.

The import tariff rates in the existing GTAP database reflect the levels of nominal effective tariffs in 2004. These tariff rates in the original database are required to be

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the tax revenue. Here, an assumption of the cost from the lack of transparency is a pure dead-weight loss becomes meaningful.

adjusted to incorporate the irregular transfer payments, in addition to the nominal tariff rates, as long as information on the levels of trade costs from such payments are available. Malcolm (1998) suggests a procedure for incorporating improved information on taxes into existing model database while maintaining the internal consistency of the database and minimizing the impacts of the tax changes on the value flows in the database. This procedure can apply to our simulation with some minor modifications. We discuss the estimates of the amounts of trade costs from the transfer payments later in this section.

Reducing Risks with Increased Transparency

As discussed in the preceding section, improvement in the transparency of trade policy in an importing country should lead to reduced trade costs. In a standard simulation, except for irregular payments demanded by national authorities made to move goods across borders, this can be treated as technical progress in the trading process. However, in the case of transparency improvements, risk in the trading environment complicates our analysis. Some types of transparency reform, such as regulatory simplification, may lower direct costs for traders. Other forms of transparency improvements, including greater predictability in the trading system, may bring about reduction only in potential risks for exporters.

Moreover, cost reductions may be hypothetical, particularly for exporters who pay nothing for risk. In the real economy with real risks, however, most economic agents pay premiums to address risk. This is true, for example, with the purchase of insurance, information gathering on risks in the system, and other measures undertaken by traders. A few risk-loving exporters may simply pay once risk arises. In the long run, all the exporters including the risk-lovers must pay the average costs of risk through higher trading costs. Implementing a shock to the variable *ams* also works well to reduce such risks in the long run.

Quantification of the Shocks

Quantification of the initial shocks in our analysis is another issue for consideration. The importer transparency indices are simply the principal factors. They do not carry any information on measurement units. The former section discussed the tariff-equivalent measures for transparency improvement. The estimated conversion ratio is about - 1.312 between the percentage change in ITI and that in tariff factor. Multiplying the assumed percentage change of ITI by this conversion ratio makes the percentage change in tariff factor ($1 + \tau$) have an equivalent effect on trade costs.

The rates of change in trade costs from improved transparency reflect two parts: (i) the technical progress or removal of pure loss, and (ii) the removal of irregular transfer payments with reduced scope for corruption and other hidden charges. The simplest way to estimate the second part, while keeping the consistency of the estimate, is to make use of their principle component scores and prorate them. Out of 11 variables constituting the transparency index, two items, i.e. irregular payments and their standard deviations[14], refer to irregular transfer payments. The principal factor scores of those two variables are 0.1585 and 0.1826, respectively. If *ITI1* and *ITI2* are defined as the import transparency indices referring to pure waste in the trading process and a tax-like transfer payment, respectively, the following relations apply;

$$ITI1 = \sum_{\alpha=1}^{9} \eta_i m_i \quad , \qquad ITI2 = \sum_{\alpha=10}^{11} \eta_i m_i \quad \text{and} \quad ITI = ITI1 + ITI2$$

where α_i is the principal factor scores of the variable m_i. The variables, m_{10} and m_{11} are the measures of irregular payments and their standard deviations.

The policy shock in our baseline simulation assumes improving importer transparency in the APEC region such that no economy is below the current regional average[15] with the scores of both reductions of waste and irregular payments being the same or above average. We define the contributions of the changes in *ITI1* and *ITI2* to the changes in

[14] As a background assumption, a higher standard deviation in irregular payments forces importers to pay more irregular payments to avoid obstacles to crossing the border.

[15] The average figure is slightly different from that used by Helble, Shepaerd and Wilson (2007) (around 0.54), because of rounding error and only *ITI2* being lower than regional average in Korea.

ITI under the baseline scenario, as *CntITI1* and *CntITI2*. As the regional average of *ITI*, *ITI1* and *ITI2* are 0.557, 0.419 and 0.138, their contributions are calculated as:

$$CntITI1 = \frac{\log((ITI1+1) - \log(1.419)}{\log(ITI1+1) - \log(1.419) + \log(ITI2+1) - \log(1.138)} * (\log(ITI+1) - \log(1.557))$$

$$CntITI2 = \frac{\log((ITI2+1) - \log(1.138)}{\log(ITI1+1) - \log(1.419) + \log(ITI2+1) - \log(1.138)} * (\log(ITI+1) - \log(1.557))$$

Under our baseline scenario, the contributions are all positive, or zero. Multiplying *CntITI1* and *CntITI2* with the conversion factor (- 1.312), we obtain the tariff-factor equivalent shocks from transparency improvement in reduction of waste and irregular payments, respectively. The baseline scenario applies a considerably large initial impact to each economy. The average ITI scores of APEC members are 0.419 for ITI1 and 0.138 for ITI2.

Table 1 summarizes the model shocks under our scenario to simulate the improvement of transparency in trade policy.

Table 1: Model Shocks in Baseline Scenario and Tariff-Equivalent Import Price Reduction

	ITI in 2004	*ITI shock%*	*Shock%: Tariff Equivalent (a)*	*Contribution to (a)*	
				Technical Progress	*Irregular Payments*
AUS	0.863	0.0	0.0	0.0	0.0
BRU	*NA*	*NA*	*NA*	*NA*	*NA*
CAN	0.756	0.0	0.0	0.0	0.0
CHL	0.743	0.0	0.0	0.0	0.0
CHN	0.332	15.6	-20.5	-13.1	-7.4
HKG	0.849	0.0	0.0	0.0	0.0
IDN	0.388	11.5	-15.0	-12.3	-2.8
JPN	0.762	0.0	0.0	0.0	0.0
KOR	0.536	6.2	-8.1	0.0	-8.1
MEX	0.406	10.2	-13.4	-8.3	-5.1
MYS	0.445	7.4	-9.8	-7.5	-2.2
NZL	0.961	0.0	0.0	0.0	0.0
PER	0.319	16.5	-21.7	-17.4	-4.3
PHL	0.226	23.9	-31.3	-16.9	-14.4
PNG	*NA*	*NA*	*NA*	*NA*	*NA*
RUS	0.000	44.3	-58.1	-43.7	-14.4
SGP	1.000	0.0	0.0	0.0	0.0
THA	0.286	19.1	-25.1	-14.4	-10.7
CTP	0.809	0.0	0.0	0.0	0.0
USA	0.794	0.0	0.0	0.0	0.0
VNM	0.103	34.4	-45.2	-34.4	-10.8

(Note) The second column shows the target percentage change in ITI to achieve the baseline scenario. The third to fifth columns indicate the target percentage change in terms of tariff power (1 + t). See Appendix B for the abbreviations of the member economies.

As a policy shock under the baseline scenario, the importer transparency index (ITI) increases for China, Indonesia, Korea, Mexico, Malaysia, Peru, the Philippines, Russia, Thailand, and Vietnam. The tariff-equivalent shocks in this scenario produce large cost reductions. In particular, the import cost reduction estimated for Russia and Vietnam is above 40 percent and for the Philippines is about 30 percent. These impacts appear large compared, for example, to APEC Trade Facilitation Principle (Shanghai Accord). APEC members adopted the goal of cutting trade transaction costs by only five percent under the Accord. For example, our estimated cost reductions with improved transparency in Thailand, i.e. 25.1 percent equals to 25 times as large as the Shanghai Accord, if the

trade transaction cost is set at *Ad Valorem* 25 percent. This comparison demonstrates the significance of improved transparency as a major institutional reform in trade policy.

About 60 to 80 percent of the total trade cost reduction from transparency improvements in trade policy comes from the technical progress component, while the remaining 20 to 40 percent is attributed to the component related to irregular payments and transfer. The proportion of the impacts from irregular payments in trade costs is higher in some economies, such as Philippines, Mexico, Thailand and China. In Korea, only irregular payments appear to have a room for improvement in our scenario.

Implementing Shocks to the Model

The shock variable for the transparency improvement measures to bring about technical progress, *ams,* has bilateral arguments, and shocks can be implemented to any bilateral combinations. This is also the case for the shock variables for the reduction of irregular payments, which is emulated as import taxes *tms*. Our simulation applies these shocks to all trading partner and is not limited to APEC members. This is similar to trade liberalization under the principle of most favored nation treatment. A salient technical feature of trade facilitation measures includes this non-discriminatory outcome, because it is technically not feasible to apply the trade facilitation reforms only to a limited number of trade partners in a discriminatory manner. The improvement of transparency in trade policy apparently shares this virtue.

Helble, Sheperd and Wilson (2007) use trade data in their gravity model with the following types of aggregation: (i) all the HS Chapters, (ii) excluding raw materials (HS 1-27)[16], and (iii) excluding in addition basic manufactures (HS 1-83). The first type includes agricultural products and receives a strong bias from the existing higher tariffs. The third type suffers from fewer samples, resulting in their preferred set of results based on the second type. Our simulation includes two cases for applying shocks to the industrial sectors. The first case is to apply the same rate of shock to all the trading sectors, assuming that improvement in the transparency of trade policy accords benefits

[16] The estimated value of tariff-factor-equivalent conversion (-1.312) draws from the regression in the second type.

throughout the sectors. The second case is to exclude the raw materials sectors from the shock assuming that this sector cannot benefit at all from the transparency reform considered here.

As indicated above, the original database needs to be adjusted to accommodate the changes in irregular transfer payments. We treat them as higher nominal import tariffs. We need, therefore, to update the database to incorporate the increase in the nominal tariff rates by the amounts of additional trade costs from irregular payments. The GTAP model provides a convenient set of parameters and closure, named ALTERTAX, to adjust the tax rates while minimizing the changes in the trade and consumption flows of the original database. Appendix B discusses the technical issues in detail. Once the database is adjusted, the shocks for simulation can be implemented to *ams* for technical progress and *tms* for reduction in irregular payments in the model.

4. Simulation Results and Implications

Impacts on Bilateral Trade

Imports

Theoretically, cost reductions in all sectors, whether by import augmenting technical progress or reductions in irregular payments and bribes, should stimulate the substitution of demand in favor of imports against domestic goods. This should result in an increase in imports. Table 2 summarizes the simulation results on bilateral trade flows. Case 1 in the table assumes that import cost cuts from the improvement of transparency extend to all the sectors, and Case 2, to all sectors except for raw materials. Moreover, the trade data in Case 1 covers all the sectors, but Case 2 only covers the trade data in the sectors excluding raw materials. In Table 2, “APEC” indicates that the simulated impacts are calculated with only using the trade data among the APEC members, while “World”, with all the trade data in the world. One may note that the simulation in Heble, Sheperd and Wilson (2007) refers to intra-APEC trade only, corresponding to Case 2-APEC in Table 2.

Table 2: Estimated Impact on Nominal Imports (% change of baseline)

importers	*Case 1 (2006)*		*Case 2 (2006)*		*HSW 2004*
	Exporters		*Exporters*		*Exporters*
	APEC	*World*	*APEC*	*World*	*APEC*
1 AUS	0.0	-0.5	-0.7	-0.5	0.0
2 CAN	-2.2	-2.4	-2.1	-2.1	0.0
3 CHL	3.1	0.0	1.6	0.4	0.0
4 CHN	30.4	30.2	27.1	26.7	29.0
5 HKG	3.1	2.0	1.0	0.3	0.0
6 IDN	15.6	16.9	11.9	12.3	20.3
7 JPN	3.2	1.1	2.1	1.2	0.0
8 KOR	20.9	17.8	20.1	18.2	0.4
9 MEX	20.2	19.7	19.0	17.7	17.7
10 MYS	10.3	11.0	8.4	9.0	12.1
11 NZL	-0.7	-0.6	-0.9	-0.4	0.0
12 PER	31.2	30.5	24.4	22.3	31.0
13 PHL	60.0	62.9	55.1	57.1	47.6
14 RUS	70.6	69.3	37.8	39.2	100.7
15 SGP	2.0	1.6	2.0	2.1	0.0
16 THA	132.7	117.6	128.2	124.3	36.7
17 CTP	2.3	1.4	1.6	1.5	*n.a.*
18 USA	1.3	-0.9	0.2	-1.1	0.0
19 VNM	37.0	44.1	27.3	31.2	73.6
20 EU27	*n.a.*	-1.6	*n.a.*	-1.5	*n.a.*
21 ROW	*n.a.*	-0.8	*n.a.*	-1.0	*n.a.*
APEC Total	12.9	11.7	11.0	10.0	*n.a.*
World	11.7	4.5	7.2	3.6	*n.a.*

(Note) Authors' calculation using the GTAP model, GTAP database version 7 pre-release 6, and Gempack. Row denotes importers, and Columns denotes exporters.

In general, the reforming economies in APEC tend to increase imports. The impact is larger in the economies that undertake more significant reforms, in particular Russia, Thailand, Vietnam and the Philippines. In contrast, APEC member economies that have achieved a higher level of transparency experience minimal increases in imports[17]. The results based on our CGE model simulation here are generally comparable with those by HSW. This is to be expected because both studies use the same estimates for reductions in trade costs. The relatively minor differences in results likely arise from the difference between assumed elasticities of substitution of imports in the GTAP model, i.e.

[17] The large increase in the imports of Korea reflects the assumed reduction of irregular payment.

Armington elasticities, and estimated coefficients in the gravity model. Case 1, covering more heavily protected sectors of raw materials, indicates larger impacts in terms of percentage than Case 2. This result reflects the assumption in the model that raw material sectors are more sensitive to cost reductions in imports with the average Armington elasticity for raw materials larger.

Exports

Exports should increase significantly for economies that export to the reforming members in our analysis. In addition, the reformers themselves should expand exports in the long run, along with imports. Trade theory suggests that import barriers act as a tax on exporters, penalizing their exports. Table 3 illustrates the impact of reform on nominal exports. The notation on the cases (Case 1 and 2) and sample coverage ("APEC" and "World") follow the same as described for Table 2.

Table 3: Estimated Impact on Nominal Exports (% change of baseline)

exporters	*Case 1 (2006)*		*Case 2 (2006)*		*HSW 2004*
	Importers		*Importers*		*Importers*
	APEC	*World*	*APEC*	*World*	*APEC*
1 AUS	7.9	3.3	10.9	4.9	11.4
2 CAN	-0.4	-0.5	-0.4	-0.4	1.2
3 CHL	6.7	0.5	8.8	2.1	10.7
4 CHN	26.7	23.4	22.6	19.5	3.8
5 HKG	8.8	1.2	3.6	0.2	16.9
6 IDN	17.3	12.8	15.1	9.7	7.7
7 JPN	11.4	6.4	10.8	5.8	10.9
8 KOR	18.4	12.0	16.8	10.7	14.1
9 MEX	10.3	9.1	9.3	8.1	0.5
10 MYS	10.8	6.2	10.2	5.4	7.8
11 NZL	5.2	1.2	6.2	2.4	5.0
12 PER	32.0	26.5	26.2	22.1	2.0
13 PHL	42.9	36.8	34.0	28.4	8.2
14 RUS	60.4	41.6	43.1	33.0	13.9
15 SGP	7.3	0.9	7.9	1.8	12.9
16 THA	26.3	30.4	-31.2	35.0	8.5
17 CTP	5.5	1.7	6.0	2.0	*n.a.*
18 USA	10.6	5.0	9.3	4.3	8.5
19 VNM	5.7	0.2	5.6	13.5	5.4
20 EU27	*n.a.*	0.2	*n.a.*	0.3	*n.a.*
21 ROW	*n.a.*	0.9	*n.a.*	1.3	*n.a.*
APEC Total	12.7	9.3	8.3	7.1	*n.a.*
World	*n.a.*	4.3	*n.a.*	3.5	*n.a.*

(Note) Authors' calculation using the GTAP model and Gempack. GTAP database version 7 pre-release 6, and Gempack. Row denotes exporters, and Columns denotes importers.

The model estimates generally follow as the trade theory would indicate. Exports of the reforming economies significantly increase. The mechanism of this expansion is such that the cheaper import prices pass through the domestic production process, depressing the factor prices, and lead to lower the export prices to improve the competitiveness of their export industries to recover the trade balances[18]. Since the expansion of the reforming economies results from the improved competitiveness, their exports tend to orient toward all over the world. The impact of their exports to APEC

[18] Macroeconomic closure of the general equilibrium model ensures the expansion of their exports to achieve recovery of the trade balance, as their trade balance is determined the international capital flows.

(intra-regional trade) is greater in terms of percentage change than to the world, because of the intensified trade relations among the APEC economies. The comparison between the two cases reminds us of the higher elasticities of substitution in the raw material, because Case 1 indicates greater impacts.

There is a contrast between the two estimates with a similar and corresponding scenario, namely our estimates in Case 2 – APEC and that by Helble, Shepherd and Wilson (2007). In the estimates of the former, the expansion in exports of the reforming economies generally surpasses that of other APEC economies, while in the latter, the tendency reverses. This is a natural result, because the simulation of HSW measures the impacts to bilateral trade flows by applying shocks to the importers transparency index (ITI) in the reforming economies only. In the simulation, therefore, only the imports of reforming economies are affected. This is why the impact on imports of non-reforming economies in APEC is nil in Table 2. Accordingly, the simulated exports just reflect the increase in imports of the reforming economies in APEC, and the reforming economies result in receiving just average impacts in APEC.

Macroeconomic Benefits: Welfare and Real Gross Domestic Product

The merits of adopting a CGE model include the ability to explicitly estimate the macroeconomic benefits of reform, such as potential gains to welfare and real gross domestic product (GDP). The GTAP model contains Equivalent Variation (EV), an income measure of the welfare improvement, as a standard variable for the presentation purpose. Real GDP (the variable *rgnp* in the percentage change terms) is also an indicator often referred to in GTAP simulations, which focuses on the impacts to macroeconomic production[19]. One of the policy shocks of our simulation, *ams* that is a kind of technical progress, should directly bring about expansionary effects, as well as efficiency improvements. The other policy shock, the reduction of irregular payments also contributes to the efficiency improvements we find by expanding lower cost imports[20]. A technical progress, enabling the economy to produce more with fixed

[19] This reference indicator corresponds to the weighted sum of the sector base output in the economy.

[20] The welfare improvement from the removal of irregular payments should be smaller than that

amounts of production inputs, brings about effects similar to quantitative increases in resources, such as labor, land and capital. At the same time, the reduction of trading costs may bring about an effect that resembles removal of tax with its resulting distortion. Table 4 below summarizes the impacts on EV and real GDP of the economies of APEC, as well as non-APEC economies in the world.

Table 4: Estimated Impact on Macroeconomic Indicators

(Billion US dollar for EV, % change for real GDP)

	Case 1		*Case 2*	
	GDP	*EV*	*GDP*	*EV*
AUS	0.0	1	0.0	0
CAN	0.0	-1	0.0	-1
CHL	0.0	0	0.0	0
CHN	6.3	110	4.7	80
HKG	0.0	6	0.0	3
IDN	4.4	11	3.1	8
JPN	0.0	2	0.0	2
KOR	1.1	8	0.8	6
MEX	3.1	22	2.7	19
MYS	8.0	13	6.6	12
NZL	0.0	0	0.0	0
PER	3.9	3	2.6	2
PHL	15.0	18	11.5	14
RUS	16.1	118	9.7	75
SGP	0.2	4	0.1	3
THA	22.4	61	18.3	54
CTP	0.0	3	0.0	3
USA	0.0	1	0.0	-2
VNM	31.3	22	24.8	19
EU27	0.0	-4	0.0	-10
ROW	0.0	8	0.0	3
APEC	--	402	--	297
World	--	406	--	290

(Note) Authors' calculation using the GTAP model and Gempack. The figures are on the prices in 2006.

Four points merit discussion in regard to our results. First, the reforming economies in APEC stand to benefit significantly in regard to GDP and welfare gains with the type of

from technical progress, if the rate of reduction in trade costs is the same, because the former involves the simultaneous reduction in transfer income.

reform we examine here. In particular, Vietnam could expect an increase in real GDP by more than 30 percent[21] in Case 1. Russia, Philippines and Thailand's GDP and welfare would rise substantially, as well. The benefits to Malaysia and China would be almost one year's growth. The estimated global benefits here with transparency reform, US$406 billion in Case 1 and US$290 billion in Case 2 in the 2006 prices are larger than those reported in previous work on trade facilitation. For example, Francois et. al. (2003) assessed the welfare gains from trade facilitation to cut 1.5% of importing costs under the WTO new round, estimating the gains at about $US 63 billion for the world[22]. The base year of our estimates, 2006, is nine years after their study, and meanwhile, the real GDP in East Asia and Pacific, for example, grew nearly double. Even after the base year of the estimates is adjusted, our estimates of the gains with transparency reform are significantly larger. This means the initial impacts of our scenario is a great challenge to the total wide-ranged profound institutional reform, including the elimination of corruption, but the expected gains are huge. The estimated effects may receive the values of parameters. Appendix D summarizes the results of the systematic sensitivity analysis.

Second, the benefits materialize in these estimations only in the reforming economies. Virtually no spillover effects of the welfare gains are seen in other economies. This suggests a strong incentive to implement these reform measures to improve transparency. However, the potential gains require large-scaled industrial adjustment. Technical progress from improvements in the quality of labor force, for example, would lead to economic growth without serious industrial adjustment. However, when the technical progress takes place in specific industrial sectors, or across-the-board importing sectors (as in our case), domestic resources would shift to specific favored sectors[23]. This is the source of the welfare and real GDP gains. This finding requires further investigation of the sector base impacts which follows in the next sub-section.

Third, non-APEC economies do not gain in a significant manner with the specifications

[21] As a general tendency, EV in terms of national income amount to similar magnitude to GDP.
[22] The scenario assumes the liberalization of 50% of border measures. Their study is based on the 1997 dollar value.
[23] In our case, the production resources are expected to shift from importing sectors to exporting and/or non-traded goods sectors.

we adopt here. Non-APEC member economies, as well as non-reforming APEC members, are assumed to take no reform action. The only possible source of gain for these economies is efficiency improvements, such as expansion of the industrial sectors with comparative advantages. However, the effects appear weak in the simulation.

Fourth, the impacts from the reduction of irregular payments at the border with lower levels of corruption and higher transparency are smaller than those from technical progress. This reflects: (i) the irregular payments are accompanied with the reduction in transfer income to national authorities, offsetting the net impacts; and (ii) the relatively smaller contributions to the trade cost reduction from the reduction of irregular payments, around 20 to 40 percent in the total shocks. The impacts on the world welfare attributable to the reduction in irregular payments are US$73 billion and US$52 billion in Case 1 and 2, about 18 percent of the total impacts.

Sector-based Impacts on Domestic Production

As briefly discussed in the previous section, sector-base analysis would be required to assess the needs for industrial adjustment. Table 5 below summarizes the percentage change in the real production and output of the four domestic industrial sectors.

Table 5: Sector-base Impact on Domestic Real Production (%)

	Case 1				*Case 2*			
	Raw materials	*Basic Manufactur*	*Other Manufacto r*	*Services*	*Raw materials*	*Basic Manufactu r*	*Other Manufacto r*	*Services*
AUS	0.6	1.1	-1.9	-0.1	0.2	2.5	-1.8	-0.2
CAN	0.8	0.5	-2.5	0.0	0.7	1.5	-2.8	-0.1
CHL	-0.3	-0.1	-5.5	0.2	-0.9	1.2	-6.1	0.0
CHN	-5.4	-1.1	0.8	2.6	-0.8	-4.7	0.3	2.1
HKG	-2.2	-4.3	-7.1	0.7	-0.1	1.7	-1.6	-0.1
IDN	-1.9	-2.2	6.7	1.3	-1.1	-4.0	3.3	1.8
JPN	0.2	1.3	0.6	-0.2	0.3	1.8	0.1	-0.3
KOR	-4.1	1.0	0.2	0.0	-1.0	-1.5	0.4	0.2
MEX	-1.1	-2.1	3.8	0.2	-0.7	-2.8	3.0	0.7
MYS	-4.3	-3.9	5.3	-0.2	-3.6	-4.6	4.2	0.7
NZL	0.0	0.6	-3.8	0.1	-0.2	1.9	-3.8	-0.1
PER	0.7	2.3	-11.9	1.6	2.0	0.8	-11.0	1.8
PHL	-16.6	-19.5	54.6	5.4	-10.7	-27.9	46.0	6.9
RUS	-0.7	-3.8	-23.5	2.4	-0.2	-14.1	-28.7	4.0
SGP	-0.9	0.1	2.2	-0.4	-1.5	3.6	2.5	-1.3
THA	-22.6	-21.9	14.7	26.2	-15.2	-26.9	17.0	28.4
CTP	-0.7	1.4	-1.6	0.1	-0.6	3.1	-2.3	0.0
USA	0.9	0.7	-0.7	-0.1	0.6	1.2	-0.6	-0.1
VNM	-15.6	-28.5	15.7	17.2	-17.4	-38.6	-2.6	22.3
EU27	0.1	0.0	-1.7	0.2	0.4	0.8	-1.3	0.0
ROW	0.3	-0.1	-2.5	0.1	0.2	1.0	-2.3	-0.1

(Note) Authors' calculation using the GTAP model and Gempack.

Case 1 assumes that improvement of transparency leads to the reduction of importing cost in all the industrial sectors, while Case 2 assumes that raw materials do not benefit. As expected, the economies with greater potential for improvement in transparency would face more serious industrial adjustment, if they implement the reform. In Case 1, where the adjustment need is more serious, Russia needs to shrink all the sectors but services (SRV). Improved terms of trade and increased imports would likely compensate for the shrinkage of trading sectors, but this may be a kind of "Dutch Disease" syndrome. The Philippines, Thailand and Vietnam face a reduction in raw materials and basic manufactures (MNB) and expansion in assembling manufacture (MNA) to a greater degree.

Comparing both cases here, case 2 does not involve the need to reduce raw material production, as the scenario precludes the reduction of importing costs in the raw material sector, equivalent to protecting the sector. This provides one reason why the

macroeconomic benefits in Case 2 are smaller than Case 1. Another reason could be that in Case 2 the coverage of the sectors that have technical progress and efficiency gains is smaller.

Trade Diversion

In theory, trade facilitation reform measures tend to create less trade diversion effects. Table 6 summarizes the impacts on the direction of nominal trade. Overall, exports from and to APEC members increase. The largest gains are associated with exports from APEC members to APEC members, followed by that from non-APEC to APEC members, and that from APEC to non-APEC. One may note also that the exports from non-APEC economies to non-APEC economies are lowered by about 3 percent or less. The trade relations between the APEC members has been strong, and even non-discriminatory trade liberalization measures, such as transparency improvements, would intensify intra-regional trade ties. However, these somewhat negative impacts on the nominal trade between the non-APEC economies are generally much smaller than the bilateral preferential trade liberalization, such as regional trade agreements.

Table 6: Impacts on Directions of Nominal Exports (%)

Case 1		importers		
		APEC	non-APEC	World
exporters	APEC	12.7	3.3	9.3
	non-APEC	9.5	-3.4	0.4
	world	11.6	-1.4	4.3
Case 2		importers		
		APEC	non-APEC	World
exporters	APEC	10.9	0.4	7.1
	non-APEC	7.7	-2.1	0.5
	world	9.8	-1.4	3.5

(Note) Authors' calculation using the GTAP model and Gempack.

Implications from the Simulation Results

Significant Impacts from Transparency Improvement

The significant magnitude of macroeconomic impact estimated here would involve the need to undertake substantial industrial adjustment with possible labor dislocation. Indeed, our simulation indicates large potential changes in production structures in the reforming economies in APEC. In this sense, the macroeconomic benefits may work as both an incentive and disincentive to policy makers in moving forward with reform. Notwithstanding, our results suggest that the large-scaled institutional reforms associated with transparency could bring about considerable welfare gains and expanded trade, even compared to other trade facilitation measures. While the goal to improve the importer transparency index to 0.56 may be greatly challenging for some of the developing economies in APEC, they could undertake more moderate and staged targets initially.

Reforming Transparency for Reforming Economies

As is relatively common with a CGE simulation, economic reform policies tend to mainly benefit countries that undertake reform without significant leakage to outside the economy. This is the case for the transparency improvement in trade policy examined here. In this sense, the transparency reforms resemble domestic regulatory reforms.

Impact on Non-Member Economies

While trade facilitation measures are non-discriminatory and will benefit non-members in the world with causing little trade diversion effects, our results suggest that trade relations would be further intensified among Asia Pacific economies with the reform measures examined here. In general, transparency improvement in Asia Pacific will be a win-win proposition for all the countries in the world, as well as APEC economies.

Relation to Free Trade Agreements and Multilateral Process

In East Asia, regional trade agreements, such as Free Trade Agreements (FTAs), are increasingly dominant trade liberalization tools. The APEC process appears to be influenced directly and indirectly by this trend. While an FTA will work as a building block to achieve free trade in the world, serious trade diversion and formation of closed trade blocks would be the undesirable bi-products. Trade facilitation measures, including the improvement in transparency, are inherently suitable for multilateral and open-regional initiatives with little trade diversion. In the regional trade liberalization initiatives, simultaneously promoting FTAs and trade facilitation may work as very effective policy mix while providing complementarities each other.

Further Research

Several issues remain for the future research suggested by our results here. Our simulation assumes only a basic static specification of perfect competition with constant returns to scale. Other specifications, including increasing returns to scale, should be tested, particularly in the context of trade in the Asia Pacific region. Assessing the policy implications on the combination of FTAs and trade facilitation reform in the Asia Pacific region would be another issue of interest. There may be a possibility to offset the shortcomings associated with only one mode of reform at a time. Finally, there is room for further theoretical consideration and empirical research on the cost of reducing mechanisms of transparency improvement, including the magnitude of irregular payments, in particular. This is relevant in regard to reducing risks for the exporters that could be addressed in CGE modeling.

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Appendix A: Estimate and Characteristics of Importer Transparency Index (ITI)

As in the text, the ITI index in HSW is the first principal factor, combining 11 variables linearly; i.e. 3 variables on predictability of customs administration (time spread for import, standard deviation of irregular payments, and favoritism), 4 variables of predictability and the simplification of trade policy (percentages of bound tariff lines, tariff dispersion, hidden barriers, and E-readiness), and 4 variables on simplification of customs administration (clearance time of imports, numbers of agencies involved in import, numbers of documents required for import, and irregular payments). The variables are largely taken from surveys, such as Global Competitiveness Report and Doing Business of the World Bank, The table below summarizes the weights of the components for the first principle factor, together with their data source.

Table: Weights of the Components

Indicator	Source	Estimated Weight
Percentage Tariff Unbound	MAcMAP (2007)	0.054
Tariff Dispersion	MacMAP (2007)	0.017
Std. Irregular Payments	Global Competitiveness Report (2005)	0.183
Import Time Spread	Logistics Percepeption Index (2007)	0.050
Lack of E-Readiness	UN Governemt E-Readiness (2007)	0.102
Clearance Time for Import	Doing Business (2007)	0.225
Number of Import Documents	Doing Business (2007)	0.048
Number of Agencies	Logistics Perception Index (2007)	0.064
Favoritism	Global Competitiveness Report (2005)	0.119
Irregular Payments	Global Competitiveness Report (2005)	0.158
Hidden Trade Barriers	Global Competitiveness Report (2005)	0.195

(Source) Helbel, Shepherd and Wilson (2008)

Contribution of the first factor is 66 percent. As all the scoring weights are positive, the first factor can be naturally interpreted as the general tendency, commonly involving in the components. Larger weights are assigned to clearance time for imports, hidden trade barriers, irregular payments, and their standard deviation. Among them, clearance time

for imports and irregular payments rather directly relate to the cost for trade, while others are risk factors.

One should note that the factor analysis does not explain the structural mechanism of the transparency, but it aims to simply condense the variables into fewer factors with maximizing their variance. In addition, the variables used here may contain wider information, not limited to transparency. The obtained ITI may possibility reflect not only transparency in a narrower sense, but also institutional efficiency, or even modernization of trade procedures of the economy. An economy with higher ITI is likely to have better institutions in trade. In this sense, the index in the gravity regression should be regarded as proxy, representing all the institutional efficiency, openness and fairness in trade, while these ideas can be regarded as transparency.

Appendix B: Table of Region and Sector Aggregation

Region Code	Economy	Sector Code	Industry
1 AUS	Australia	1 RAW	Raw material
2 CAN	Canada	2 MNB	Basic manufacture
3 CHL	Chile	3 MNA	Other manufacture
4 CHN	China	4 SRV	Services
5 HKG	Hong Kong		
6 IDN	Indonesia		
7 JPN	Japan		
8 KOR	Korea		
9 MEX	Mexico		
10 MYS	Malaysia		
11 NZL	New Zealand		
12 PER	Peru		
13 PHL	Philippines		
14 RUS	Russia		
15 SGP	Singapore		
16 THA	Thailand		
17 CTP	Chinese Taipei		
18 USA	United States of America		
19 VNM	View Nam		
20 EU15	European Union (15 countries)		
21 ROW	Rest of the World		

Appendix C: Adjusting GTAP Database to Incorporate Irregular Payments

The existing GTAP model and database are not equipped with the irregular transfer payments in the trading process, which is to be changed as a shock in the simulation. In the text, we have suggested treating such payments as an import tax. The import tariff rates in the existing GTAP database reflect the levels of nominal effective tariff in 2001. These tariff rates in the original database should be adjusted to incorporate the irregular transfer payments, in addition to the nominal tariff rates, as long as information on the levels of trade costs from such payments are available. This Appendix discusses the methodology and results of the adjustments in some detail.

Methodology

Malcolm (1998) suggests a procedure for incorporating improved information on taxes into existing model database, while maintaining the internal consistency of the database and minimizing the impacts of the tax changes on the value flows in the database. This procedure can also apply well to our simulation with some minor modification. Based on the suggestion by Malcolm, the GTAP model provides a convenient program, named ALTERTAX, to adjust the tax rates by using the model itself to create a new database, while minimizing the changes in the trade and consumption flows of the original database. A simulation is run where tax rates are shocked to their desired value and the updated post-simulation database is used for subsequent policy experiments.

More specifically, Malcolm (1998) suggests using a special closure and a special parameter file to ensure that the rate-changing simulation left other cost and sales shares as little changed as possible. His closure fixes regional trade balances, whilst his parameter settings amount to "Cobb-Douglas everywhere" -- this keeps nominal budget shares fixed[24]. Accordingly, the Armington elasticities, ESUBM and ESUBT, are set as one. The ALTERTAX closure holds DTBALR (the percentage change in the ration of trade balance over national income) exogenous for all regions except one (in our case, the rest of the world: ROW), and CGDSLACK exogenous for that one region.

[24] See Help file for RunGTAP program for actual implementation.

Shocks for Adjustment

The amounts of shock on nominal import tax, *tms*, to adjust the pre-shock database are set at the negative double of the shock to be applied. This modest adjustment may help minimizing the estimate bias to the updated GTAP database, which has been recently released. This adjustment provides enough allowance to avoid the pos-shock tariff rates to be negative.

Appendix D: **Sensitivity Analysis of the Simulation**

The model simulation relies on the assumption of the values of parameters. While the empirical estimates provide the values of the parameters in the model, the lack of data often induce modelers to use estimated values in other countries. Sensitivity analysis is undertaken to observe the difference of the simulation outcome by changing the values of parameters. The magnitude of the difference in the outcome provides modelers with confidence of the reliability of the simulation, which may affect judgments on the reliability of policy implications to be drawn from the simulation.

The simulation results of the GTAP model, particularly in regard to the impact on changes in trade depend on the assumed values of the Armington elasticities. They represent the elasticity of substitution between the share of an exporter county in the total imports of the importing country and the relative import prices of the country[25]. Sensitivity analyses are conducted on the values of the Armington elasticities in many cases to test the robustness of the simulation results.

The Gempack software, used for the simulation, provides a tool for conducting Systematic Sensitivity Analysis (SSA). Selecting one or two different sets of parameter values and solving the model for each set is a simple form of sensitivity analysis, sometimes referred to as *ad hoc* sensitivity analysis. However, this approach sometimes requires unrealistically many runs and reruns of simulations to obtain a result. The SSA approach can considerably reduce the required number of the simulations. Table D-1 below summarizes the results of SSA on our simulation on the impacts to the nominal imports, by changing the values of the Armington elasticities: (i) between the imports of a country and (ii) between the imports and domestically produced goods. The elasticities are changed to 125 percent (i.e. 25 percent increase) and 75 percent (i.e. 25 percent reduction). The two elasticities are assumed to change together, and the

[25] Assuming that the Armington elasticiy of some goods imported by the United States is six, Japanese share in the total imports of the United States is 10% for the goods, and the relative price of the imported goods from Japan compared to the average import prices of goods is one. If the relative price rises by one percent, then the share of the goods imported from Japan in the United States will become 9.4%, six percent decline (i.e. 0.01 x 6 x 10%). The same idea also applies to the substitution between the domestically produced goods and imported goods.

triangular distribution is applied.

Table D-1: Sensitivity Analysis on Nominal Imports by Changing Armington Elasticities (%)

importers	Case 1: World			Case 2: World		
	Base	Mean	S.D.	Base	Mean	S.D.
1 AUS	0.3	0.3	0.2	0.2	0.2	0.3
2 CAN	-2.2	-2.2	0.2	-1.9	-1.9	0.2
3 CHL	0.1	0.1	0.2	0.3	0.3	0.3
4 CHN	36.9	37.2	6.3	28.5	28.8	8.5
5 HKG	2.5	2.5	0.4	0.8	0.9	0.3
6 IDN	19.1	19.2	3.3	11.7	11.7	3.8
7 JPN	0.6	0.6	0.6	0.6	0.6	0.9
8 KOR	16.9	16.9	2.1	12.9	13.0	2.9
9 MEX	15.0	14.9	2.4	11.7	11.7	3.3
10 MYS	10.3	10.2	1.4	7.9	7.8	2.0
11 NZL	0.4	0.3	0.2	0.6	0.6	0.3
12 PER	27.0	27.2	4.9	15.8	16.0	5.2
13 PHL	78.0	77.2	12.9	61.2	62.4	16.1
14 RUS	97.3	98.2	14.3	58.2	58.3	12.9
15 SGP	0.9	0.9	0.3	1.3	1.3	0.6
16 THA	41.1	41.1	6.0	29.5	29.7	7.2
17 CTP	0.3	0.3	0.3	0.5	0.5	0.4
18 USA	-0.4	-0.4	0.4	-0.5	-0.5	0.5
19 VNM	37.5	38.3	5.4	23.6	26.1	0.7
20 EU15	-1.0	-1.0	0.1	-0.9	-0.9	0.0
21 ROW	-0.2	-0.2	0.2	-0.5	-0.5	0.1

(Note) Base, Mean and S.D. in the columns indicate the simulation in the base case, the average (mean) value of the sensitivity analysis simulations, and standard deviation of the sensitivity analysis simulations, respectively.

It is found that the standard deviation for the nominal trade change is relatively large. This indicates that the simulation results are sensitive to the values of Armington elasticities. For example, the estimated large increase in the imports of Russia and Philippines in Case 1 are subject to the possibility to be around 30 to 40 percent, wih the confidence interval of the three standard deviations (i.e. 89% confident). One should be careful to draw the implication from the simulation that the impacts on nominal trade to Russia and Philippines more than 70 percent and 80 percent. Rather, the implication is that these impacts would be large, perhaps more than 30 percent.

The analysis on the welfare improvement in Table D-2 shows that the standard deviations of the welfare improvement in terms of EV are generally small, compared to the mean values. For example, even the wide confidence interval of 4.5 standard deviation (i.e. 95% confident) range covers $260 billion for Case 1 and $170 billion for Case 2. The large welfare gains to APEC economies estimated here, therefore, appear to be generally sound.

Table D 2: Sensitivity Analysis on Equivalence of Variation by Changing Armington Elastiticies (Billion UD$)

	Case 1			Case 2		
	Base	Mean	S.D.	Base	Mean	S.D.
AUS	1	1	0	0	0	0
CAN	-1	-1	0	-1	-1	0
CHL	0	0	0	0	0	0
CHN	110	110	6	80	80	5
HKG	6	6	0	3	3	0
IDN	11	11	0	8	8	0
JPN	2	2	1	2	2	1
KOR	8	8	1	6	6	1
MEX	22	22	0	19	19	0
MYS	13	13	0	12	12	0
NZL	0	0	0	0	0	0
PER	3	3	0	2	2	0
PHL	18	18	1	14	14	1
RUS	118	118	9	75	75	4
SGP	4	4	0	3	3	0
THA	61	63	4	54	55	5
CTP	3	3	0	3	3	0
USA	1	1	3	-2	-2	3
VNM	22	22	0	19	19	0
EU15	-4	-4	4	-10	-10	3
ROW	8	8	1	3	3	1
APEC	402	--	--	297	--	--
World	406	--	--	290	--	--

(Note) see Table D-1 above.